

Operating Instructions

Pressure Probe ODS 4 K

English



1 Introduction

Pressure probe ODS 4 K is used for precise measurement of ground and surface water levels.

For this purpose the pressure probe determines the atmospheric pressure of the water column on a reference-pressure measuring cell. A pressure-compensation capillary in the probe cable provides the measuring cell with the current ambient air-pressure as a reference. Thus, faulty measuring results caused by atmospheric-pressure fluctuations are avoided.

Depending on the version, the pressure probe provides an analogue output signal direct proportional to the water level. The output signal is between

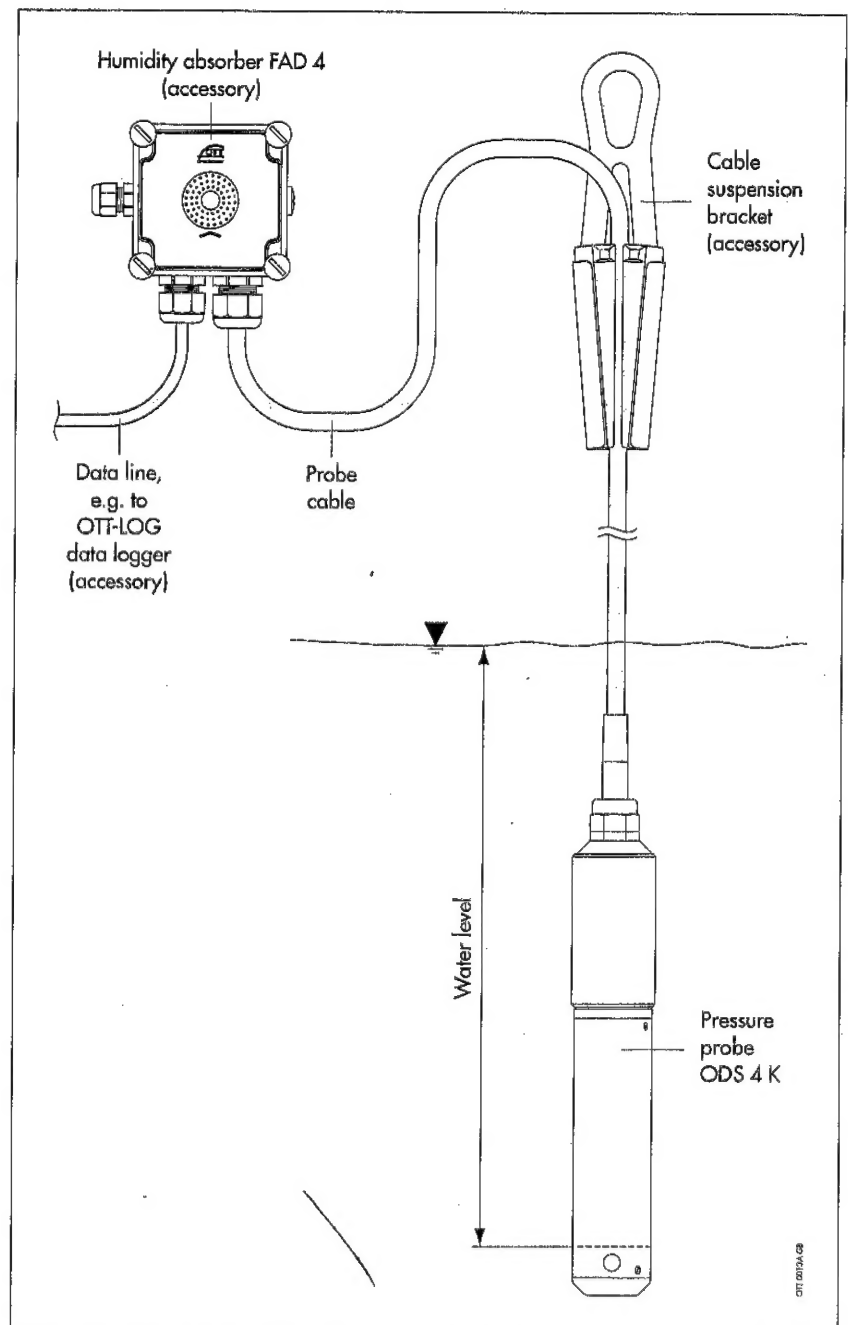
1 and 5 Volt or
4 and 20 mA.

This allows universal usage of the pressure probe, for example for activation of recorders, alarm devices, switching contacts or data loggers as well as the indication of measuring data (in connection with a display device).

Fig. 1: Principle configuration of a water level measuring point with the OTT pressure probe ODS 4 K

Humidity absorber FAD 4 serves as connection point for the probe cable and the data line and it dehumidifies the ambient air that reaches the pressure compensation capillary tube of the probe cable.

The pressure probe contains a terminal strip, which allows the connection of cables of individual lengths.



2 Safety Instructions

Only use the pressure probe ODS 4 K and the accessories as described in these operating instructions.

Pressure probes with probe cables that have been connected by yourself must only be used for measurement points with a maximum water level of 50 m. For higher water levels only use probes with factory-installed probe cables. Open the pressure probe only for connecting the probe cable. Do not under any circumstances remove the set screws in the center of the probe housing. Before lowering the pressure probe, check whether the probe cable is connected correctly. Otherwise the probe may get lost.

In any case, strictly adhere to the limit values stated in the technical data section. Connect the probe only to voltages smaller than 15 V DC (1–5 V version) respectively 26 V DC (4–20 mA version). Always use an electrically decoupled safety low voltage as power supply.

Observe carefully!

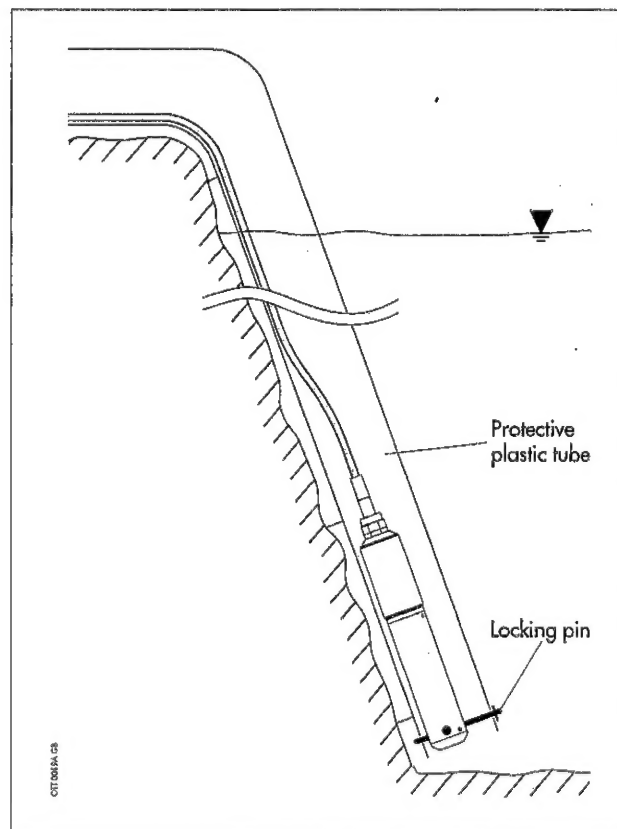
3 Installing the Pressure Probe

3.1 Notes on the Mounting Location

Pressure probe ODS 4 K can be put to various uses, for example in tubes or boreholes wider than two inches in diameter, in wells, open waters – even in non-vertical position (e. g. bank slope); in not permanently water-carrying riverbeds. The pressure probe's dead weight prevents the probe body from floating to the surface. The pressure probe can be easily fixated in flowing waters or waters with waves. When designing the measurement location, observe the hydrodynamic influence of strong currents ($> 0.5\text{--}1\text{ m/s}$)! Depending on the version and the type of mounting of the individual components, underpressure or overpressure may occur which might distort the measuring result. The pressure probe is – depending on the type and location of mounting – saltwater-proof.

Fig 2: Installation example for pressure probe ODS 4 K in open waters.

In waters with strong currents or waves a locking pin is used for secure fixation of the probe (push locking pin through openings in protective tube and pressure probe); protective cover/locking pin made of synthetics, e. g. PE-HD; do not use PVC!



Notes on the installation in surface waters!

Important: It is not recommended to install the pressure probe in the vicinity of docks, industrial waste water discharges or areas with high chemical pollution. The pressure probe is made of high-quality stainless steel and synthetic material. Nevertheless damaging corrosion may occur, depending on the installation location. For further information refer to the technical data section.

Mounting the pressure probe is easy and comprises three steps:

- Connecting the probe cable to the pressure probe
- Lowering (submerging) the pressure probe
- Mounting the humidity absorber FAD 4

3.2 Connecting the Probe Cable to the Pressure Probe

For measuring ranges of water levels up to 50 m you may connect the probe cable yourself to the probe. This step is not required when using a pressure probe with factory-installed probe cable.

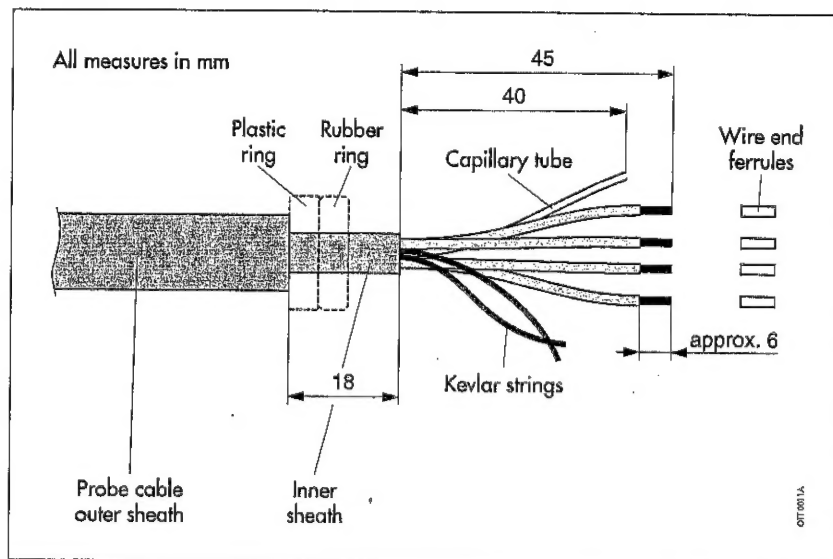
Avoid any dirt at the connection!

Important: When connecting the probe cable there must not be any impurities (dust, sand) in the area of the sealings (o-rings, pipe casing, cable screw bushing/probe cable). Otherwise the probe may not be sealed watertight.

Fig. 3: Stripping lengths of the probe cable at the probe side.

Non-stretching kevlar strings in the probe cable ensure exact measurement values, as the pressure probe is always located in the same depth position.

(The screen between the inner and outer sheath of the pressure probe cable is not connected.)



Proceed as follows:

Strip the insulating cover from one end of the pressure probe cable as shown in Fig. 3. Be careful not to damage (cut) or bend the capillary tube in the process.

Tip: To facilitate tying of the kevlar strands later, we recommend that you first remove the insulation from about 100 mm of the cable outer sheath.

Slip on the wire end ferrules and crimp in place using a special crimping tool (flat nose pliers);

Unscrew the set screw and remove the pipe casing.

Now slip the following components onto the probe cable: pipe casing, coupling ring, buckling protection sleeve (first apply a few drops of silicon oil to the outer pipe sheath), screw-joint, plastic ring and rubber ring (see Fig. 4);

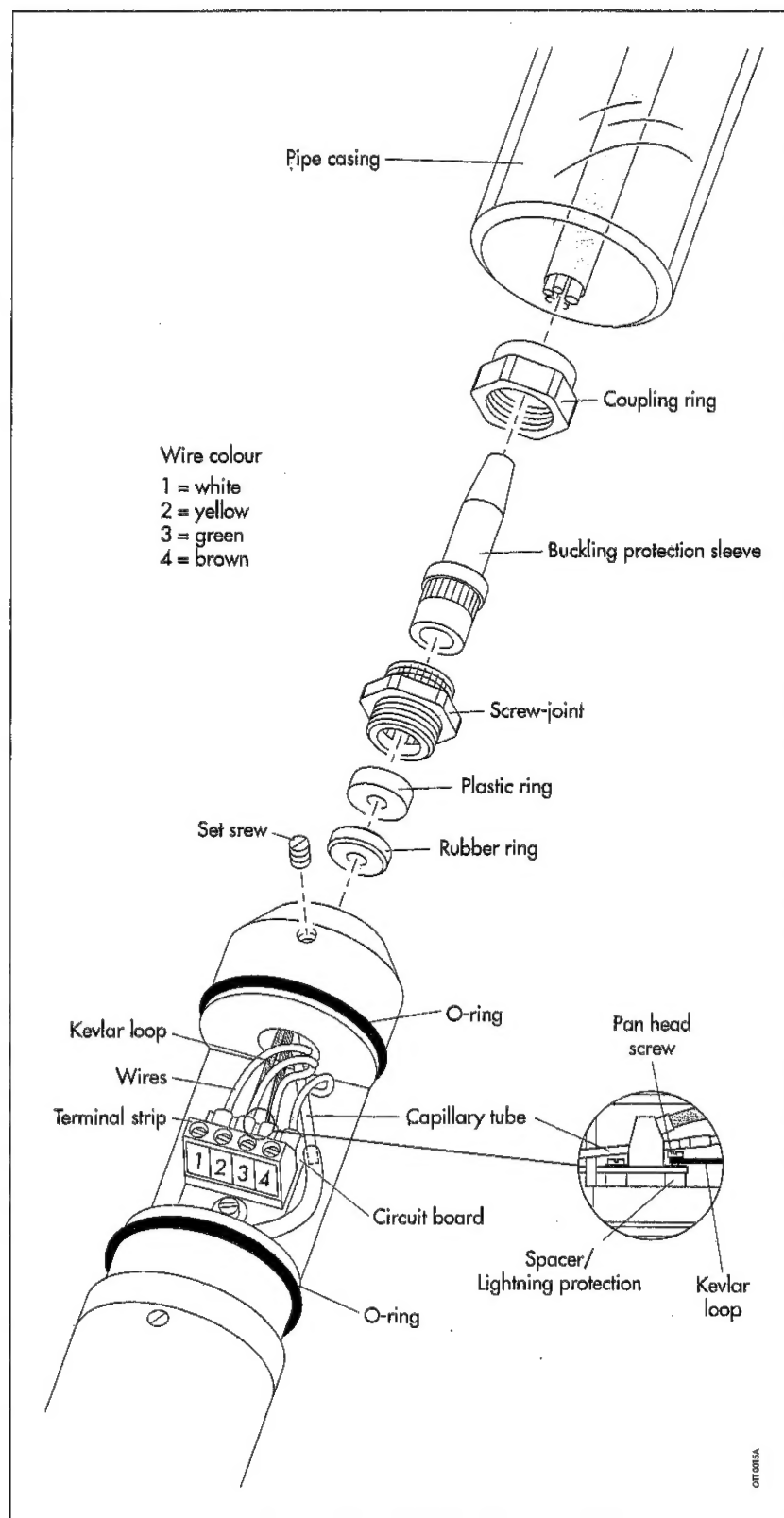
Push the inner sheath of the probe cable together with the plastic and rubber ring into the pressure probe until it stops;

Apply LOCTITE 572 threading seal to the screw-joint threading. Screw in the joint and tighten securely (span of the jaw = 24);

Insert the buckling protection sleeve into the screw-joint, fit the coupling ring and tighten very securely (span of the jaw = SW 24);

Now arrange and tie the kevlar strands (non-tensioned) around the pan head screw (slightly unscrewed) as illustrated in Fig. 4; Use ordinary super glue to fasten the knots in place. Important: Make sure that the spacer under the circuit board is not skewed during this process.

Fig. 4: Connecting the probe cable
to pressure probe ODS 4 K



Connect the wires on the terminal block;
 Push the capillary tube ends about 5 mm into each other and then place under the circuit board;
 Insert two dessicant bags (SILGEL);
 Fit the pipe casing and screw in the set screw.
 Keep the other end of the pressure probe cable sealed (with adhesive tape, for example) until you have assembled the FAD 4 humidity absorber. No moisture must be allowed to penetrate the capillary tube while the pressure probe cable is being routed.

Do not open the pressure probe after use!

Important: Do not open the pressure probe after it has been in use. When replacing the probe cable at a later time, observe the instructions outlined in chapter 6 „Replacing the Probe Cable“.

3.3 Lowering the Pressure Probe

First determine the minimum and maximum water levels at the measuring point (for example with a staff gauge or contact gauge. Determine the probe position from these two values. The following prerequisites must be met:

Position the probe below the minimal water level;

Difference between maximum water level and probe position < measuring range of the probe.

Example: Pressure probe type with 10 m measuring range; 1–5 V output; built-in into a tube with a length of 18 m

min. water level 12.40 m (corresp. to a contact gauge value of 5.60 m)

max. water level 16.72 m (corresp. to a contact gauge value of 1.28 m)

→ Positioning the probe, for example for a water level of 10 m

→ Output signal at a water level of 16.72 m: 3.688 V

Lower the pressure probe at the probe cable to the determined depth. Hint: The cable has markings at 0.25 m intervals.

Place the cable suspension onto a hook. Insert the probe cable into the opened clamp jaws of the cable suspension and fasten the cable by pushing together the clamp jaws.

Depending on the usage, the fine adjustment of the probe position may be performed with downstream electronic offset control (for example). If the measured value is to be referenced to a zero level, this can be achieved by an input to the evaluation software of the connected peripheral device. Therefore, in most cases a coarse positioning of the probe is sufficient.

In not permanently water-carrying riverbeds the pressure probe delivers a continuous output of 1 V, respectively 4 mA, in "dry condition"!

4 Installing Humidity Absorber FAD 4

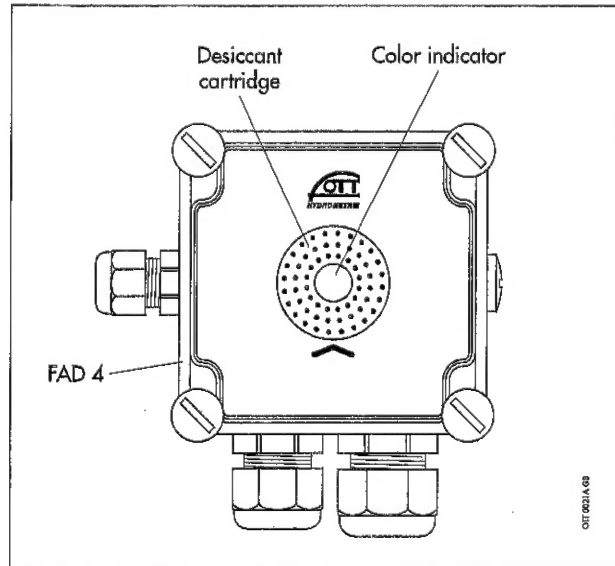
4.1 Introduction

Humidity absorber FAD 4 has two functions:

- Dehumidifies the ambient air reaching the pressure compensation capillary;
- Connects the probe cable with the data line via a terminal strip.

Fig. 5: Humidity absorber FAD 4

The humidity absorber contains a desiccant cartridge. The color indicator shows the degree of moisture absorption.
Blue: OK
Pink: saturated; replace



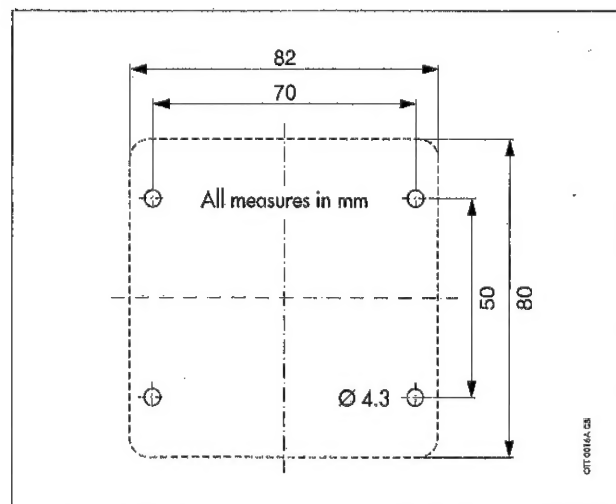
4.2 Mounting the FAD 4

Mount the humidity absorber in a place as dry as possible. If the absorber is mounted in a switch cabinet, it is important that pressure compensation with the ambient air is possible (cabinet must not be hermetically sealed!).

Proceed as follows:

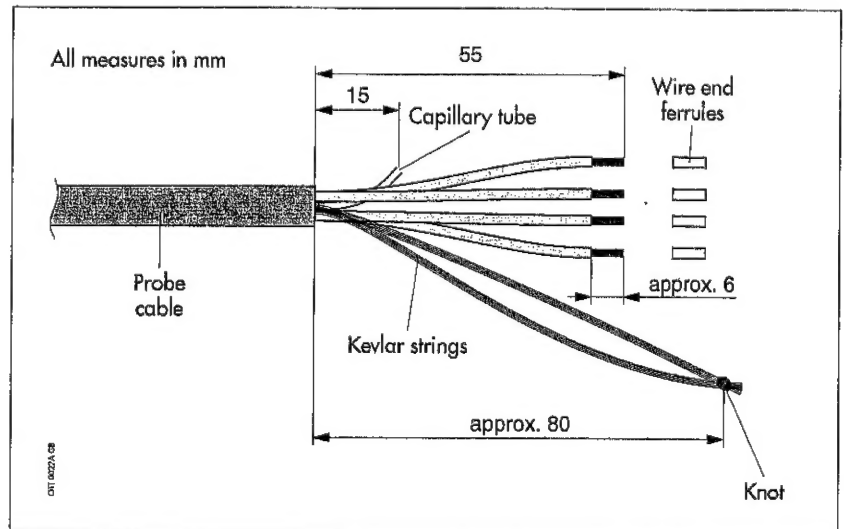
- Remove the transparent cover;
- Mount the humidity absorber onto a solid base with four screws (4 mm Ø); see drilling template.

Abb. 6: Drilling template for mounting the humidity absorber FAD 4



Pass the probe cable through the larger cable screw bushing (PG 13.5);
 Remove the insulation on one end of the probe cable according to figure 7. Do not damage (cut) or buckle the capillary tube!
 Slip on wire end ferrules and crimp the ferrules onto the wire with a special crimping tool (flat nose pliers);
 Form a loop with the kevlar strings. Secure the knot with commercially available instant glue (superglue)! Insert a Phillips screw into the kevlar loop (see figure 8).

Fig. 7: Stripping lengths of the probe cable at the humidity absorber side.
 (The outer and inner sheathes of the pressure probe cable must be cut to a length of 55 mm.)



- ✦ Pull the probe cable tight and tighten the screw connection firmly by hand; connect the probe cable wires to the terminal strip.
- ✦ Connect the data line to the peripheral device or evaluation electronics.
- ✦ Place a desiccant cartridge into the free space above the terminal strip. The color indicator in the center of the cartridge must be blue.
- ✦ Immediately replace the transparent cover and secure with 4 knurled screws.

Fig. 8: Connection example of the humidity absorber to a pressure probe with 4-20 mA output

Note: Do not remove cable screw bushing with filter insert! It provides protection against moisture and dust.

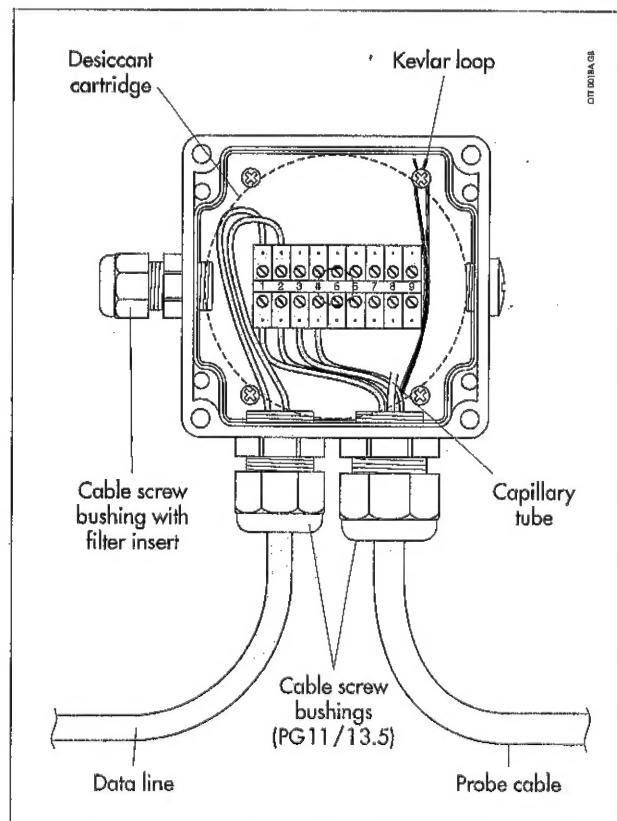


Table 1: Output signals of the pressure probe

1-5 Volt version: terminals 2 + 3
 4-20 mA version: terminals 1 + 2
 (Current caused by the probe supply)

Terminals/Wire assignment in the FAD 4

Terminal	Wire colour	1-5 V	4-20 mA
1	white	+U _{power}	+U _{power}
2	brown	0 V _{out}	0 V _{power}
3	green	+U _{out}	
4	yellow	0 V _{power}	

Check the color indicator in regular intervals!

4.3 Checking the Desiccant Cartridges

The desiccant cartridges are filled with material that absorbs moisture from the ambient air. Through the desiccant and by a special moisture repellent filter in the cable screw bushing on the side, the air in the humidity absorber is dehumidified. This prevents moist ambient air (caused by temperature and air-pressure fluctuations) from entering the capillary tube. Moisture could clog the capillary tube by condensate formation and thus could cause inaccurate measuring results.

Check the color of the indicator in regular intervals. The frequency of the intervals is dependant on the overall humidity of the air. It is recommended to perform the checks in monthly intervals after the first installation. After that, the intervals can be increased according to the actual situation. Also consider seasonal climate fluctuations.

When the indicator changes its color from blue to **pink**, the desiccant cartridge has no more dehumidifying effect and must be replaced by a cartridge with **blue** indicator.

The desiccant cartridges can be recycled by drying at 120-130 °C in a conventional baking oven. When the color changes to blue again, the drying procedure is complete. Immediately after cooling off place the desiccant cartridge into the supplied airtight storage container.

Thus you will always have a usable desiccant cartridge (blue color indicator) at hand.

5 Determining the Maximum Load Resistance for Pressure Probes with Output Signal 4 to 20 mA

The load (load resistance) of a pressure probe must not exceed a certain maximum value. This value depends on the supply voltage of the pressure probe. If the load resistance is higher, the output current can no longer be evaluated. Smaller loads are, of course, acceptable without problem.

Observe for pressure probes with 4-20 mA output!

The maximum load for the different applications is shown in the following diagram

Example: Supply voltage 24 Volt → max. load resistance 650 ohms.

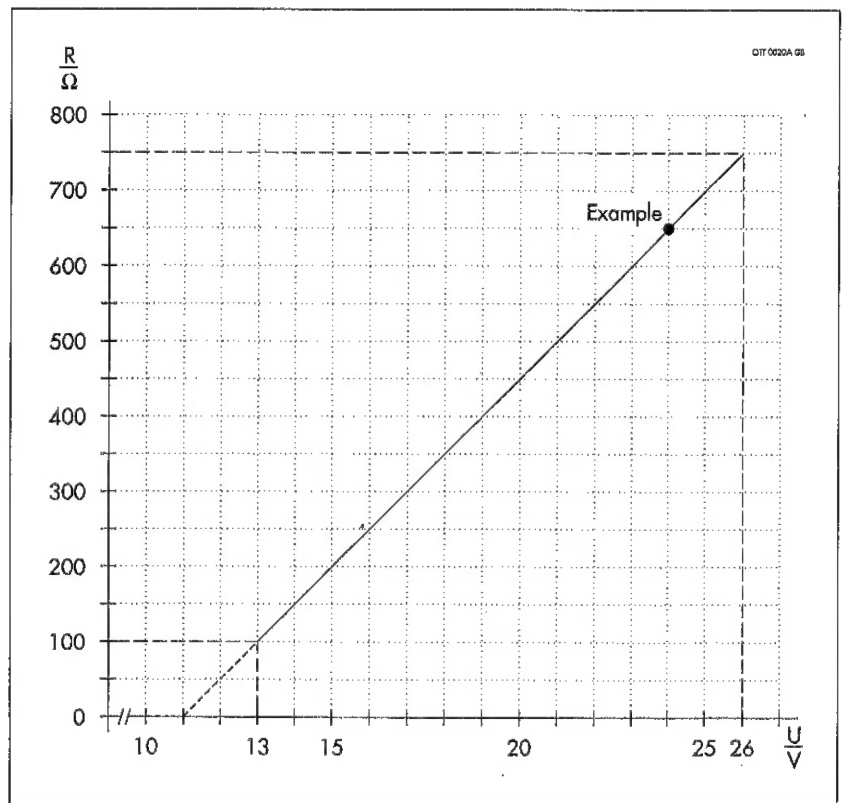
Up to a load resistance of 650 ohms the probe will deliver an output current proportional to the measuring value.

Therefore, the connected electrical circuitry has to be rated accordingly (check the input resistance of the connected peripheral device).

For cable lengths > 100 m also consider the conductor (wire) resistance of the probe cable: approx. 37 ohms per 1000 m of cable.

Fig. 9: Diagram for determining the maximum load resistance in relation to the supply voltage.

Minimum supply voltage: 13 V
Maximum supply voltage: 26 V



6 Replacing the Probe Cable

If required, the probe cable can be easily replaced at a later point in time. Also replace both o-rings and the entire cable screw bushing of the pressure probe, thus ensuring that the pressure probe stays sealed after the replacement. For this purpose, a spare parts kit is available from OTT; Order number: 55.410.083.9.2.

Remove old o-rings.

Rub silicon oil into the new o-rings and then fit them.

Important: The o-ring "seats" must be perfectly clean.

Rub some silicon oil onto the o-ring and slip it on.

Important: The o-ring "seats" must be absolutely clean! Continue as described in Chapter 3.2 "Connecting the pressure probe cable to the pressure probe".

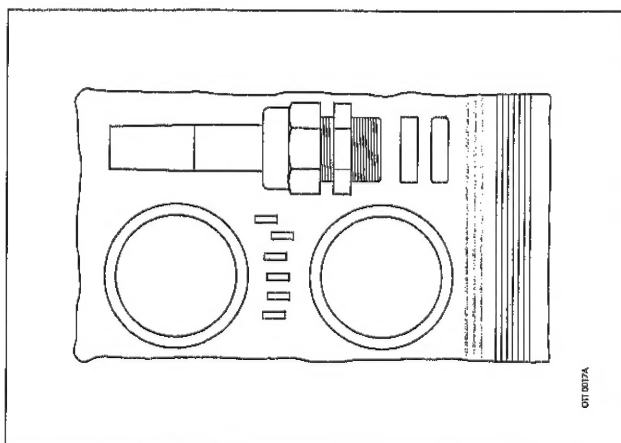


Fig. 10: Spare parts kit

7 Maintenance

Due to the high-quality design of the pressure probe no regular maintenance measures are required. Even a thin layer of residual deposits at the measuring cell will not cause any relevant distortion of the measuring values.

If high dirt accumulation occurs due to algae, sludge, fouling or sediments, the pressure probe has to be checked from time to time. For example, inaccurate or invalid measuring values indicate that the measuring cell is "blocked" (which can be easily seen because the zero point has shifted). Due to its robust measuring cell, the pressure probe can be cleaned unproblematically, if required.

For this purpose, proceed as follows:

Note the current measuring value.

Pull out the pressure probe with the probe cable from the tube or protective tube. When pulling out the probe, do not change the length of the suspension! For measuring points in surface waters: If required, dismount and clean the protective tube.

Remove both set screws and the black protective cap. Carefully clean the measuring cell with a brush (hard bristles). Furring can be removed with conventional household decalcifying agent. Make sure to observe all application notes and safety instructions of the decalcifying agent!

Rinse the pressure probe with clear water.

Remount the protective cap and screw in both set screws.

Lower the pressure probe with the probe cable into the stilling tube or protective tube.

Check the measuring value.

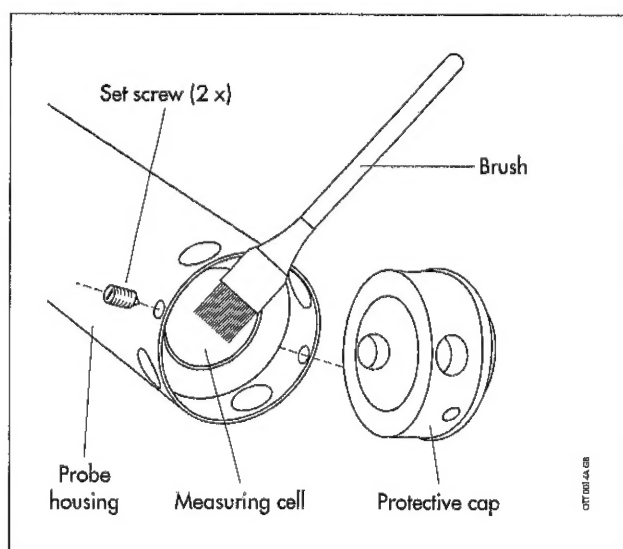


Fig. 11: Cleaning the measuring cell

8 Technical Data

Pressure probe	capacitive, oil-free ceramic reference-pressure measuring cell; temperature-compensated
Dimensions l x Ø	237 mm x 42 mm
Distance measuring cell/probe bottom edge	25 mm
Weight	0,9 kg
Measuring range	4 m/10 m/40 m water column ¹⁾
Overload-protected	up to max. 50 m water column
Material of probe housing	stainless steel (1.4539; V4A; SS 316)/synthetics (POM)
Protection against water penetration	pressure-tight up to 50 m water column
Lightning protection	integrated
Temperature range	-5 to +45 °C
Maximum measuring deviation ²⁾	
4 m measuring range	± 0.25 % ³⁾ ± 1 cm
10 m measuring range	± 0.1 % ³⁾ ± 1 cm
40 m measuring range	± 0.1 % ³⁾ ± 4 cm

1-5 V Version

Supply voltage	8-15 Volt DC; typ. 12 V
Current consumption	max. 4 mA
Output signal, short circuit-proof	1-5 V ⁴⁾
Formula to calculate the output signal	$U_{out} = 1 \text{ V} + \frac{\text{water level} \times 4 \text{ V}}{\text{measuring range}}$

4-20 mA Version

Supply voltage	13-26 Volt DC; typ. 24 V
Output signal (= current consumption)	4-20 mA
Load resistance	max. 750 Ω
Formula to calculate the output signal	$I_{out} = 4 \text{ mA} + \frac{\text{water level} \times 16 \text{ mA}}{\text{measuring range}}$

CE

EMI limit values

- ESD protection	fulfills EN 61000-4-2 Intensity 3 (8 kV air discharge)
- Protection against electromagnetic fields (EMF)	fulfills EN 61000-4-3 Intensity 3 (10 V/m)
- Protection against transient interference (burst)	fulfills EN 61000-4-4 Special intensity (4 kV)
- Protection against lightning impulse voltage (surge)	fulfills EN 61000-4-5 Intensity 4 (4 kV)
- Conducted and radiated interference	fulfills EN 55022 Class B

Notes on Mounting Location and Mounting Type

The following factors lead to increasing corrosion of the pressure probe:

- Water pollution by chemical solvents
- Particles of low-alloyed steels, e. g. from sheet pile walls (rust film)
- Low-oxygen water → select mounting location with sufficient water flow
- Chloride, also evaporating from synthetics → do not use protective tube made of PVC
- Fixation of the probe housing with clamp fittings, also made of plastic
- Additional encapsulation of the probe housing

If possible, submerge the pressure probe only temporarily for measuring into the water and remove after measuring is complete, if the environmental conditions are critical.

¹⁾ Special version for water column up to 200 m ²⁾ at 20 °C

³⁾ of the measuring range ⁴⁾ Load resistance > 20 KΩ

Handwritten notes and calculations at the bottom of the page:

$U_{out} = 1 \text{ V} + \frac{\text{water level} \times 4 \text{ V}}{\text{measuring range}}$
 $U_{out} = 1 \text{ V} + \frac{40 \text{ m} \times 4 \text{ V}}{40 \text{ m}} = 2 \text{ V}$
 $I_{out} = 4 \text{ mA} + \frac{\text{water level} \times 16 \text{ mA}}{\text{measuring range}}$
 $I_{out} = 4 \text{ mA} + \frac{40 \text{ m} \times 16 \text{ mA}}{40 \text{ m}} = 20 \text{ mA}$

Scope of delivery

ODS 4 K	Standard:	1 pressure probe with reference-pressure measuring cell including terminals for connecting a probe cable of custom length
	Customized:	as standard, but with ready-made probe cable

Order numbers

ODS 4 K	1-5 V	Measuring range	Designation	Order number
	Output			
		0- 4 m	4,0 PV	63.035.311.9.2
		0-10 m	10 PV	63.035.313.9.2
		0-40 m	40 PV	63.035.315.9.2
		0- 20 m ¹⁾	20 PV	63.035.029.4.5 ³⁾
		0-100 m ^{1) 2)}	100 PV	63.035.031.4.5 ³⁾
		0-200 m ^{1) 2)}	200 PV	63.035.032.4.5 ³⁾
	4-20 mA			
	Output			
		0- 4 m	4,0 PA	63.035.331.9.2
		0-10 m	10 PA	63.035.333.9.2
		0-40 m	40 PA	63.035.335.9.2
		0- 20 m ¹⁾	20 PA	63.035.029.4.5 ⁴⁾
		0-100 m ^{1) 2)}	100 PA	63.035.031.4.5 ⁴⁾
		0-200 m ^{1) 2)}	200 PA	63.035.032.4.5 ⁴⁾

¹⁾ Special design

²⁾ starting at a measuring range of 50 m only ready-made at the factory

³⁾ Basic type 63.035.310.9.2 + pressure sensor ...

⁴⁾ Basic type 63.035.330.9.2 + pressure sensor ...

Accessory	Probe cable	
	- 4 wire with pressure-compensation capillary and kevlar core; per m	97.000.018.4.5
	Humidity absorber FAD 4	63.035.107.3.2
	- 2 desiccant cartridges	
	- 1 storage container	
	- 10 wire end ferrules; 1 mm ²	
	Straight cable suspension	97.140.071.9.5
	Angular cable suspension	20.450.133.4.1
	Suspension bracket for ORG 46 top cap	55.410.069.4.2
	Data line	96.000.035.9.5
	- Type: LIYCY 5 x 0,14 mm ² ; per m	

Spare parts	Spare parts kit	55.410.083.9.2
	- 1 cable screw bushing with buckling protection sleeve	
	- 2 o-rings	
	- 1 plastic ring	
	- 1 rubber ring	
	- 6 wire end ferrules; 1 mm ²	